

WHAT IS CLAIMED IS:

1. A method of manufacturing a semiconductor device, comprising:

forming an insulating layer on a semiconductor substrate;

forming a contact hole on the insulating layer;

depositing a barrier metal in the contact hole and on the insulating layer using an atomic layer deposition process;

depositing a tungsten layer on the barrier metal using the atomic layer deposition process;

and

filling the contact hole with a tungsten.
2. The method of claim 1, wherein the atomic layer deposition process for the barrier metal and the tungsten layer is performed in a single reaction chamber.
3. The method of claim 1, wherein the barrier metal is WSiN layer.
4. The method of claim 1, wherein the tungsten is deposited by chemical vapor deposition.
5. The method of claim 3, wherein a single atomic layer of the WSiN layer is deposited by a continuous cycle comprising:

injecting SiH₄ gas,

purging any remaining SiH₄ gas using an inert gas;

injecting WF₆ gas;

purging the remaining WF₆ gas using an inert gas;

- injecting NH_3 gas; and
- purging any remaining NH_3 gas using inert gas.
6. The method of claim 3, wherein the WSiN layer has a thickness of 20 to 100Å.
7. The method of claim 5, wherein the SiH_4 gas is injected at a flow rate of 50~100 SCCM.
8. The method of claim 5, wherein the WF_6 gas is injected at a flow rate of 10~50 SCCM.
9. The method of claim 5, wherein the NH_3 gas is injected at a flow rate of 30~80 SCCM.
10. The method of claim 7, wherein the SiH_4 gas and the WF_6 gas are injected in a ratio of 1:5.
11. The method of claim 8, wherein the SiH_4 gas and the WF_6 gas are injected in a ratio of 1:5.
12. The method of claim 2, wherein the tungsten layer is deposited at a temperature of 200 to 600°C.
13. The method of claim 1, wherein a single atomic layer of the tungsten layer is deposited by a continuous cycle comprising:
- injecting SiH_4 gas;
- purging any remaining SiH_4 gas using an inert gas;
- injecting WF_6 gas; and
- purging any remaining WF_6 gas using an inert gas.

14. The method of claim 13, wherein the tungsten layer is deposited to a thickness of 20 to 100Å.

15. The method of claim 5, wherein the inert gas is any one of Ar gas and a mixture of Ar gas and H₂ gas.

16. The method of claim 13, wherein the inert gas is any one of Ar gas and a mixture of Ar gas and H₂ gas.